

EXECUTIVE SUMMARY

BP America Production Company (BP), representing itself and more than 20 other natural gas development companies (collectively referred to as the “Operators”), has submitted a proposal to the U.S. Department of the Interior (USDI) Bureau of Land Management (BLM) Rawlins Field Office (RFO) to expand development of natural gas and condensate resources within two previously developed project areas described as the Continental Divide/Wamsutter II and Creston/Blue Gap project areas. The BLM has designated the new consolidated proposal the Continental Divide-Creston (CD-C) Natural Gas Development Project.

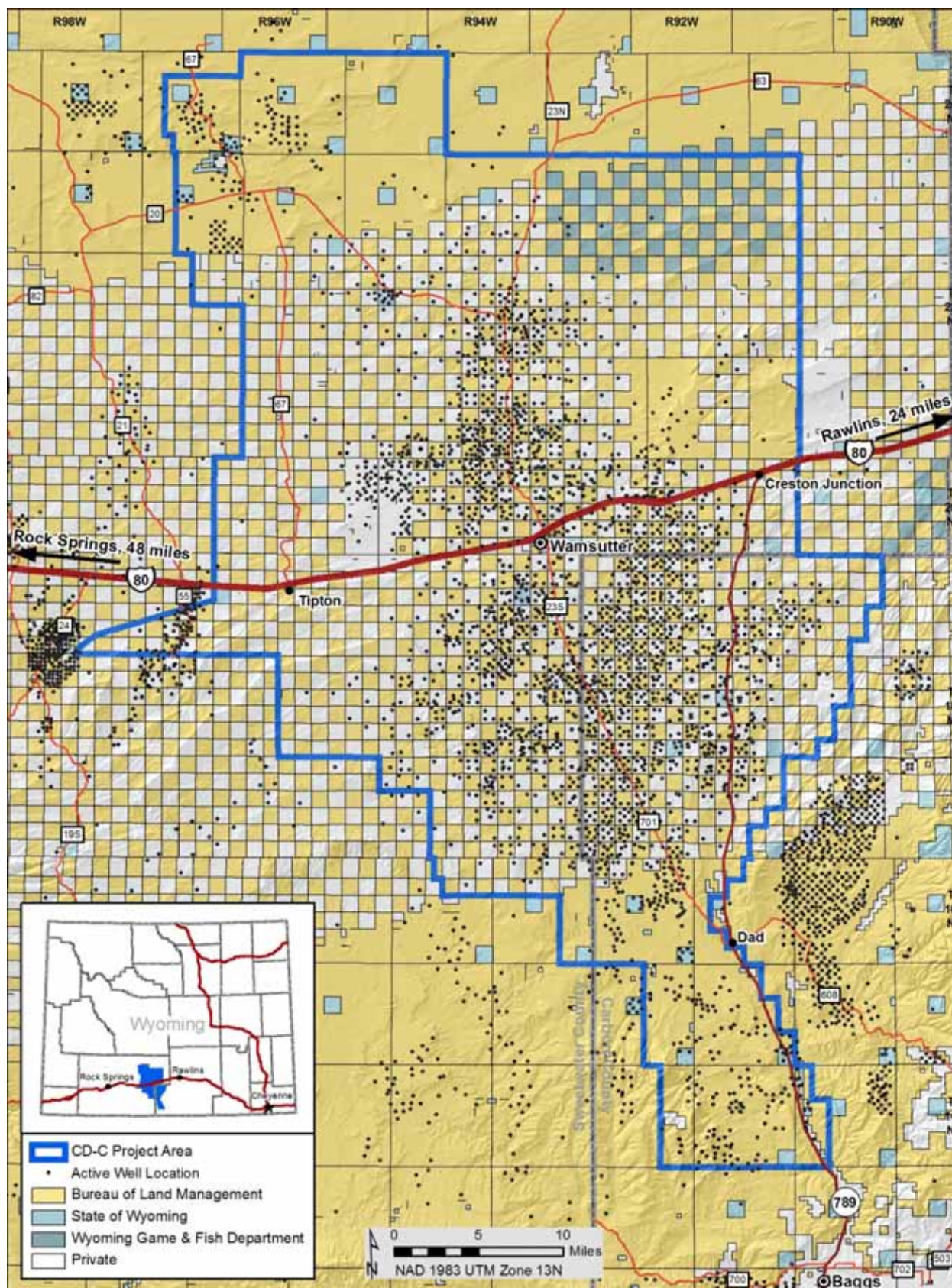
The RFO has determined that the proposed project constitutes a major federal action requiring preparation of an Environmental Impact Statement (EIS). This EIS serves the purpose of disclosing and analyzing impacts resulting from the development proposed within the CD-C project area with consideration of identified and applied Best Management Practices (BMPs) and Conditions of Approval (COAs). A summary of these BMPs and COAs is included in **Appendix C**.

The CD-C project area consists of approximately 1.1 million acres (1,672 square miles) in an existing gas-producing region between Rock Springs and Rawlins, Wyoming and bisected by Interstate 80 (**Map ES-1**). The project area is located on lands administered by the federal government (626,932 acres, 58.6 percent) and the State of Wyoming (48,684 acres, 4.5 percent), as well as private lands (394,470 acres, 36.9 percent), in Carbon and Sweetwater Counties. The central portion of the CD-C project area has a *checkerboard* pattern of mixed land ownership produced by grants made by the federal government in the 19th century to the Union Pacific Railroad (UPRR) Company to spur construction of the transcontinental railroad.

The Operators propose drilling up to 8,950 infill natural gas wells with a potential surface disturbance of 47,200 acres (4.4 percent of the project area). The precise locations of the wells have not been identified at this time but the Operators anticipate drilling at well densities of up to one well per 40 acres. Wells may be drilled conventionally with a vertical well bore on a single pad or with multiple directional bores from a single pad. The proposed project includes construction and operation of ancillary facilities such as: roads; gas, water, and condensate-gathering pipelines; overhead and buried power lines; and separation, dehydration, metering, and fluid-storage facilities.

More than 4,400 wells have already been drilled within the CD-C project area under previously authorized drilling programs; over 500 of those have been plugged and abandoned. Supporting infrastructure associated with the existing development includes access roads, compressor stations, a central gas-processing plant, water management facilities (fresh-water wells and evaporation pits, recycling facilities, and injection wells for produced water disposal), gas and water pipelines, and electric power lines. Total existing surface disturbance in the project area, including that associated with natural gas and other development, is estimated at 60,176 acres (5.6 percent of the project area).

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Map ES-1. Project boundary and existing natural gas development (EIS Map 1-1)

No warranty is made by the BLM for use of the data for purposes not intended by the BLM.

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PURPOSE AND NEED FOR THE ACTION

The BLM's purpose and need is to determine the conditions under which the applicant's exercise of valid existing rights from federal oil and gas leases within the CD-C project area may be developed in accordance with its multiple-use mandate, the Mineral Leasing Act (MLA) of 1920 as amended by the Federal Land Policy and Management Act of 1976 (FLPMA), and the Federal Onshore Oil and Gas Leasing Reform Act of 1987. The MLA, as amended, provides that exploration and development of domestic oil and gas is in the best interest of the United States. The intent of the MLA and its implementing regulations is to allow, and essentially encourage, lessees or potential lessees to explore for oil and gas or other mineral reserves on federally-administered lands. The BLM will consider approval of the proposed drilling in a manner that reduces impacts on water, wildlife, and other resources throughout the CD-C project area, consistent with the lease rights granted to the applicant.

SCOPING AND PUBLIC INVOLVEMENT

The BLM conducted two public and internal scoping processes to solicit input and identify environmental issues and concerns associated with the proposed project. The first responded to a proposal by operators of the Creston/Blue Gap project to expand drilling in that project area, under what was titled the Creston/Blue Gap II project. A Notice of Intent (NOI) for the Creston/Blue Gap II proposal was published in the *Federal Register* on September 8, 2005. A public meeting was held at the Jeffrey Center in Rawlins on October 13, 2005, and the official scoping period ended November 15, 2005.

Shortly after the Creston/Blue Gap II scoping process was completed, BP submitted a proposal for additional drilling in the Continental Divide/Wamsutter II project area. The BLM decided to combine the two projects and prepare a single EIS. The NOI for the combined Continental Divide-Creston Natural Gas Development Project was published in the *Federal Register* on March 3, 2006. The BLM prepared a scoping notice and provided copies to the public, other government agencies, and Tribes. The notice included information on scoping and announcement of an open house, which was held at the Jeffrey Center in Rawlins on April 6, 2006. The official scoping period ended May 5, 2006.

The BLM also invited other federal, state, and local government agencies to participate in the EIS process as cooperating agencies. The State of Wyoming, Sweetwater County, the Little Snake River Conservation District, and the Sweetwater County Conservation District requested and received Cooperating Agency status.

Written comments received during both public scoping periods consisted of 50 comment letters from federal and state agencies, non-government organizations, and one Tribe, as well as individuals and private corporations.

Key issues and concerns identified through scoping are discussed and addressed in Chapters 3, 4, and 5 of this document, and include the following:

- Air Quality: What are the potential project and cumulative impacts on air quality, including Air Quality Related Values (AQRV)?
- Cultural resources: Estimate the effects on the historic trails and transportation corridors in the project area.
- Water resources: What is the potential for degradation of water quality by project construction and drilling activities? What are the issues related to disposal of produced water associated with coalbed methane production?
- Land ownership as it affects mitigation: Opportunities to reduce impacts through mitigation may be complicated by land ownership patterns in the *checkerboard*.

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- Non-native, Invasive Plant Species: Evaluate the current and projected presence of non-native, invasive species.
- Range Resources: Evaluate the potential loss of livestock forage and project-associated hazardous conditions for area livestock/livestock operations.
- Special Status Species: What are the Threatened, Endangered, or Candidate species and Sensitive wildlife species that could be impacted by the project and what would be the extent of the effects?
- Socioeconomics: Define the impact of the project on traditional socioeconomic indicators such as employment, housing, tax revenues, and human services.
- Surface Disturbance/Reclamation: Define the extent of existing and proposed surface disturbance and its effects on resources in the project area.
- Wildlife Habitat: Evaluate the project's effects on wildlife habitat, including fragmentation and subsequent effects on the value of that habitat.

The BLM has determined that the proposed project is in conformance with BLM management plans and policies and is consistent with other federal and local land management plans and policies. The BLM will use the public comment process under the National Environmental Policy Act (NEPA) to comply with the public consultation requirements of Section 106 of the National Historic Preservation Act.

PROPOSED ACTION AND ALTERNATIVES

Chapter 2 of the EIS describes the Operators' Proposed Action, four development alternatives, and the No Action alternative that are analyzed in the document. In addition to the four development alternatives carried forward for analysis in this EIS, two other development alternatives were considered but dismissed from detailed analysis.

Proposed Action. Under the Proposed Action, up to 8,950 additional natural gas wells would be drilled from an estimated 6,126 well pads. Spacing of well pads would vary according to location within the project area. An estimated 42 percent of the future wells would be located on multiple-well pads and drilled to formation directionally. To fully develop the targeted resources, the Operators would collectively drill the new wells at the rate of approximately 600 wells per year over a period of 15 years. The productive life of each well is estimated to be 30 to 40 years. Combining well life with a 15-year production period produces a potential project life of 45 to 55 years. In support of the new wells, the Operators would construct additional access roads, pipelines, overhead and buried electric power lines, a gas processing facility, water management and disposal facilities, and equipment storage facilities. The total new surface disturbance for the Proposed Action would be an estimated 47,200 acres, or about 4.4 percent of the project area.

Alternative A: 100-Percent Vertical Drilling. Alternative A examines the possibility that all 8,950 wells would be drilled vertically from single-well pads. All ancillary elements of the new development would be the same as the Proposed Action. The estimated surface disturbance for Alternative A is 61,696 acres (5.8 percent of the project area), a 31-percent increase over the Proposed Action.

Alternative B: Enhanced Resource Protection. The premise of this alternative is that some resources may be more at risk from intensive natural gas development and thus may require protections and mitigations beyond the basic measures ordinarily applied. The alternative identifies the following resources that may be more at risk from natural gas development:

- Mule deer crucial winter range,
- Pronghorn crucial winter range,
- Greater sage-grouse lek, nesting/brood-rearing habitat, and winter concentration areas,
- Ferruginous hawk nesting habitat,

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- The Muddy Creek and Bitter Creek corridors and watersheds,
- Chain Lakes alkaline wetland communities and other playas, and
- Livestock forage.

Each resource has basic protections provided by RFO Resource Management Plan (RMP) requirements, BMPs, COAs, and on right-of-way grants. This alternative would add enhanced protections to each Application for Permit to Drill (APD) or right-of-way grant on BLM-administered lands and federal mineral estate in the appropriate habitat or area of the identified resource. One of the enhanced protections would require that APDs in most of the identified habitats above be submitted as part of a development plan whose aim is to limit overall impacts. For some resources, further protections and mitigations would be applied only if a threshold were reached. These thresholds are defined for a specific percentage of habitat loss—usually 5 or 10 percent of a lease—and for a reduction of a species population to an unacceptable level.

The estimated surface disturbance for the Enhanced Resource Protection Alternative is 45,516 acres (about 4.3 percent of the project area), slightly less than the Proposed Action.

Alternative C: Surface Disturbance Cap – High and Low Density Development Areas. Under this alternative the portions of the CD-C project area that have seen the most intensive natural gas development to date would be designated as high-density development areas (**Map 2-1** in the EIS). The amount of unreclaimed surface disturbance allowed per section of public land in these areas would be capped at 60 acres at any one time. The remainder of the project area would be designated as low-density development areas, with an unreclaimed surface disturbance cap of 30 acres per section at any one time. The 60-acre cap represents the disturbance associated with a 9-well per section drilling program (80-acre spacing) achieved with vertical wells only, a typical development in the high-density area; a 30-acre cap represents the disturbance associated with a 16-well per section drilling program (40-acre spacing) achieved with directional drilling. All prior natural gas surface disturbance committed to long-term use for roads or on-pad production facilities and all disturbance that had not been successfully reclaimed would count against the cap. Successfully reclaimed acreage would not count against the cap.

About 44 percent of the CD-C project area would be within the high-density development area. The average historic surface disturbance within the high-density area is 33 acres per section, with an average of 5 wells per section. In the low-density areas, the average disturbance is 4.5 acres per section with an average of less than 1 well per section. About 24 percent of the CD-C project area has had no development to date.

Only BLM-administered lands and mineral estate in the CD-C project area would be subject to the cap. The estimated surface disturbance of this alternative is 42,955 acres (about 4 percent of the project area), a 9-percent decrease from the Proposed Action.

Alternative D: Directional Drilling. This alternative would require all future natural gas wells on BLM-administered lands and federal mineral estate to be drilled from multi-well pads. In areas with no existing oil and gas development, one multi-well pad would be permitted per section (or per lease if the lease area is less than a section). A single access corridor would be permitted for required roads, pipelines, and electrical power distribution for each new multi-well pad. In sections with existing oil and gas development, enlargement of one existing well pad would be permitted and that pad would serve as the multi-well pad for all future drilling in that section.

Proposals for access across federal lands for oil and gas development on adjacent private and state lands would continue to be considered by the BLM. Operators may request that an APD be exempted from the general rule when an extraordinary situation exists that could limit full development of the natural gas resource.

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The estimated surface disturbance for this alternative is 36,449 acres (about 3.4 percent of the project area), a 23-percent decrease from the Proposed Action.

Alternative E: No Action. Under the No Action Alternative, it is assumed that none of the development activities proposed by the CD-C Operators would be approved or authorized. The analysis of the No Action alternative assumes that previously authorized activities would continue but that no new development would occur.

Alternatives Considered but Eliminated from Detailed Analysis. The BLM considered two alternatives to the Proposed Action that were not carried forward for detailed analysis in this EIS—a Surface Disturbance Cap with Reclamation Credits and Debits alternative and a Focused Development alternative.

The Surface Disturbance Cap with Reclamation Credits and Debits would have placed a 30-acre cap on the amount of future surface disturbance at any one time in a section of public land, with credits and debits for successful or failed reclamation of previous disturbance. Operators would have received a credit for each acre of land successfully reclaimed and a debit for each acre not yet reclaimed, thereby providing a reward for successful reclamation and a penalty for slow or failed reclamation. The BLM determined the operation of this alternative would be unpredictable and that neither the BLM nor the operators could rely on its results. In certain instances, the formulation could yield a cap in one section of perhaps 90 acres and in an adjacent section of minus 30 acres. The complexity of the alternative and the uncertainty of its results would promote contention between the BLM and the Operators over the meaning of and the operation of the cap. Because of the complexity and the uncertainty about its effects, and because Alternative C already satisfied all the criteria for a surface disturbance cap, the BLM decided that the Surface Disturbance Cap with Reclamation Credits and Debits would not be carried forward for analysis in the EIS.

Several variations of a Focused Development alternative were considered during discussions between the Operators and the CD-C cooperating agencies between 2007 and 2009. The BLM was not a participant in those discussions. The concept of focused development is that drilling would be phased over time, focusing on completion of development within a defined area before moving to another defined area. This alternative would have provided opportunities to leave large tracts of wildlife habitat undeveloped for extended periods of time in exchange for relaxing some seasonal wildlife stipulations in the areas of focused development. Upon completion of development in a focus area, it would become an area with no activity and development would shift to the previously undeveloped area. This alternative would have required that the leaseholders in both the focus and undeveloped areas have a shared interest in developing or delaying development of their leases. With the large number of leaseholders and the fractured nature of land ownership in the project area, it proved impossible to reach agreement among a sufficient number of parties as to which properties should be developed first. The BLM concluded that unitization of the leases over such a large area would not be viable and thus could not provide a framework for focusing development. The BLM also concluded that relaxation of seasonal wildlife stipulations in focus areas—an essential element of such an alternative—was not appropriate.

AFFECTED ENVIRONMENT

Chapter 3 of the EIS describes the affected physical, biological, human, and management environment of the CD-C project area. The identified resources present within the project area provide the basis to address substantive issues of concern brought forward during internal and public scoping. Chapter 3 provides quantitative data and spatial information where appropriate to the resource, which serves as a baseline for comparison of the direct, indirect, and cumulative impacts of each of the alternatives. Following **Table ES-2** is a summary description of the Affected Environment and the Environmental Impacts by discipline.

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ENVIRONMENTAL IMPACTS: OVERVIEW

Chapter 4 of the EIS describes the environmental effects of implementing the Proposed Action and alternatives on the affected environment described in Chapter 3. The chapter is divided into subsections that address the impacts for the resources identified during scoping. Much of the analysis of impacts for each resource is related to the surface disturbance associated with the Proposed Action and Alternatives A through D, which is over and above the existing disturbance in the project area. For Alternative E, there are no new impacts. The resource-specific effects of the alternatives are evaluated quantitatively and qualitatively, as appropriate, based on available data and the nature of the resource analyzed.

Figure ES-1 displays initial disturbance by alternative with historical disturbance.

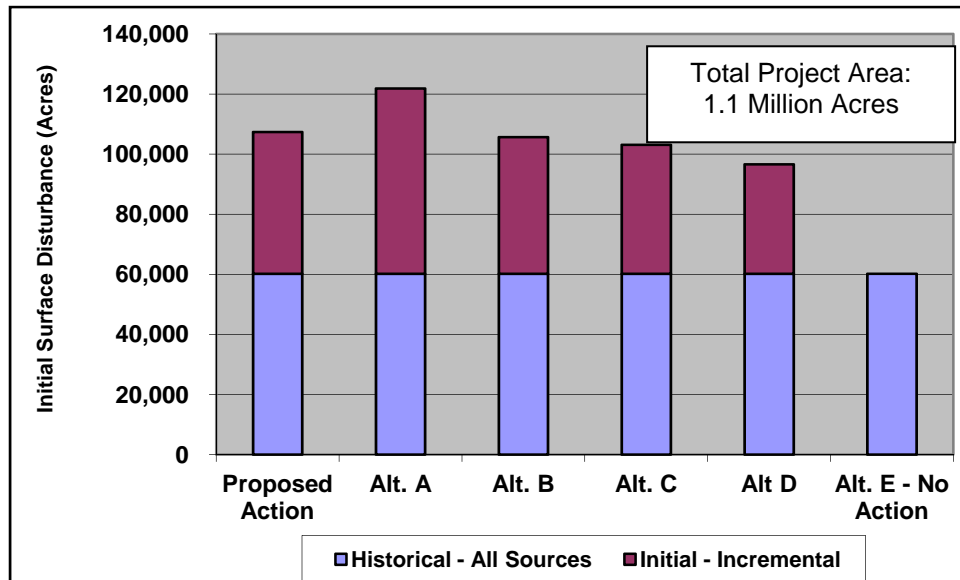


Figure ES-1. Historical and projected initial disturbance, Proposed Action and alternatives

A comparison of the disturbance within the project area associated with the Proposed Action and the five alternatives is provided in **Table ES-1**. A brief summary of the Chapter 4 impact analysis by discipline is provided in **Table ES-2**. Following Table ES-2 is a more detailed summary description of the Affected Environment and the Environmental Impacts by discipline.

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Table ES-1. CD-C surface disturbance – Historical, Proposed Action and Alternatives (acres)

Category	Surface Disturbance						
	Oil and Gas			Grand Total	Percent of Project Area	Change from Proposed Action	
	Well Pads (incl. roads)	Related Facilities ¹	Total			Acres	%
Historical							
Initial	20,524	28,694	49,218	60,176	5.6%	—	—
Long-term	6,403	2,069	8,472	17,663	1.7%	—	—
Proposed Action							
Initial	41,889	5,311	47,200	47,200	4.4%	—	—
Long-term	17,998	863	18,861	18,861	1.8%	—	—
Combined IN ²	62,413	34,005	96,418	107,376	10.0%	—	—
Combined LT ²	24,401	2,932	27,333	36,524	3.4%	—	—
Alternative A: 100-Percent Vertical Drilling							
Initial	56,385	5,311	61,696	61,696	5.8%	14,496	30.7%
Long-term	23,270	863	24,133	24,133	2.3%	5,272	28.0%
Combined IN ²	76,909	34,005	110,914	121,872	11.4%	14,496	13.5%
Combined LT ²	29,673	2,932	32,605	41,796	3.9%	5,272	14.4%
Alternative B: Enhanced Resource Protection Alternative							
Initial	40,205	5,311	45,516	45,516	4.3%	-1,684	-3.6%
Long-term	17,386	863	18,249	18,249	1.7%	-611	-3.2%
Combined IN ²	60,729	34,005	94,734	105,692	9.9%	-1,684	-1.6%
Combined LT ²	23,789	2,932	26,721	35,912	3.4%	-611	-1.7%
Alternative C: Cap on Surface Disturbance, 60 Acres and 30 Acres per Section							
Initial	37,644	5,311	42,955	42,955	4.0%	-4,245	-9.0%
Long-term	16,455	863	17,318	17,318	1.6%	-1,543	-8.2%
Combined IN ²	58,168	34,005	92,173	103,131	9.6%	-4,245	-4.0%
Combined LT ²	22,858	2,932	25,790	34,981	3.3%	-1,543	-4.2%
Alternative D: Directional Drilling							
Initial	31,138	5,311	36,449	36,449	3.4%	-10,751	-22.8%
Long-term	14,089	863	14,952	14,952	1.4%	-3,908	-20.7%
Combined IN ²	51,662	34,005	85,667	96,625	9.0%	-10,751	-10.0%
Combined LT ²	20,492	2,932	23,424	32,615	3.0%	-3,908	-10.7%
Alternative E: No Action							
Initial	0	0	0	0	0.0%	-47,200	-100.0%
Long-term	0	0	0	0	0.0%	-18,861	-100.0%
Combined IN ²	20,524	28,694	49,218	60,176	5.6%	-47,200	-44.0%
Combined LT ²	6,403	2,069	8,472	17,663	1.7%	-18,861	-51.6%

¹ Estimated future disturbance is unchanged under each alternative for "Related O&G Facilities," except for No Action, which assumes no future disturbance.

² "Combined IN" equals the sum of historic initial disturbance and future initial disturbance.

"Combined LT" equals the sum of historic long-term disturbance and future long-term disturbance.

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Table ES-2. Comparison of impacts by alternative

Feature/Resource	Proposed Action	Alternative A: 100-Percent Vertical Drilling	Alternative B: Enhanced Resource Protection	Alternative C: Cap (High and Low Density Areas)	Alternative D: Directional Drilling	Alternative E: No Action
Physical Environment						
Geology	The intensity of impacts on geologic resources would vary in relation to the surface disturbance by alternative, but would be low in all cases providing that best management practices are followed. Impacts would not be significant.					
Paleontology	Paleontological resources have been identified in over 30 localities within the project area. Implementation of the Proposed Action or any of the action alternatives may impact paleontological resources—in a negative way by destroying or damaging them and making them unavailable for scientific inquiry—to the extent that the ground is disturbed by development activities, (see Table ES-1 above). Disturbance could be beneficial by resulting in the discovery and preservation of fossils that add to scientific knowledge. Pre-disturbance surveys and disturbance mitigation where appropriate would minimize adverse impacts. The impact significance criterion would not be exceeded.					
	<i>Intermediate impact</i>	<i>Most impact</i>	<i>Intermediate impact</i>	<i>Intermediate impact</i>	<i>Lowest impact</i>	<i>No impact</i>
Soils	Impacts would be similar for the Proposed Action and all action alternatives but the extent would vary with the amount of project-related disturbance, from a high of 61,696 acres under Alternative A to a low of 36,449 acres under Alternative D . The percentage of the CD-C project area soil surface that would be initially disturbed by the Proposed Action and the action alternatives is shown below. These figures should be considered in light of the 5.6 percent of the project area soil surface that has been disturbed previously. Successful implementation of mitigation measures and BMPs would insure that significance criteria were not exceeded.					
	<i>4.4 %</i>	<i>5.8 %</i>	<i>4.3 %</i>	<i>4.0 %</i>	<i>3.4 %</i>	<i>0 %</i>
Water Resources: Surface Water	Under the Proposed Action and all action alternatives , surface water impacts could include contamination of surface water from the authorized and accidental discharge (spill) of fluids and produced water and the impacts (including sediment loading) from surface disturbance related to the construction of pad sites, roads, and pipelines. The degree of potential impact and the risk of adverse impacts is related directly to the amount of initial surface disturbance in each alternative. Each action alternative exceeds at least one of the 8 significance criteria. The number of criteria exceeded for each alternative is displayed below:					
	<i>4 criteria</i>	<i>8 criteria</i>	<i>1 criterion</i>	<i>2 criteria</i>	<i>2 criteria</i>	<i>No new impacts</i>
Water Resources: Groundwater	Significant impacts to groundwater are not expected under the Proposed Action or Alternatives because the formations targeted for gas development and produced water disposal are stratigraphically isolated from aquifers that host springs and flowing wells used for stock and domestic purposes, because of state-of-the-art construction techniques, and because of implementation of BMPs and COAs related to drilling.					

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Table ES-2. Comparison of impacts by alternative, *continued*

Feature/Resource	Proposed Action	Alternative A: 100-Percent Vertical Drilling	Alternative B: Enhanced Resource Protection	Alternative C: Cap (High and Low Density Areas)	Alternative D: Directional Drilling	Alternative E: No Action
Physical Environment, continued						
Air Quality	Impacts from the Proposed Action and all action alternatives would not cause an exceedance of any ambient air quality standard and would not exceed the Prevention of Significant Deterioration (PSD) Class II Increments at a 250-meter distance from project sources. However, modeled impacts at a 100-meter distance from field development project sources did result in short-term concentrations that were predicted to be above the 1-hour NO ₂ National Ambient Air Quality Standard (NAAQS), the 24-hour PM _{2.5} NAAQS, and the 24-hour PM ₁₀ Wyoming Ambient Air Quality Standard (WAAQS). Impacts would not exceed the PSD Class I or Class II increments at any of the Class I and sensitive Class II areas. The visibility analysis indicated a maximum of 5 days with project emissions resulting in impacts greater than the 0.5 delta deciview (Δdv) threshold at any of the Class I and sensitive Class II areas; using the 98 th percentile value as a threshold, there are zero days above the 0.5 Δdv threshold. There would be no nitrogen and sulfur deposition impacts that exceed BLM critical load values at any Class I or sensitive Class II area. In addition there would be no impacts to sensitive lakes that exceed threshold values. All BLM-approved energy development projects will comply with applicable air quality regulations and standards, as determined by the WDEQ.					
Biological Environment						
Vegetation	Vegetation has already been strongly affected; historic disturbance equivalent to 5.6% of the area's surface has already occurred. Additional disturbance would produce combined historic and project-related disturbance for the Proposed Action and each action alternative equivalent to the surface area percentages shown below. Even with successful implementation of reclamation practices, about 40 percent of the disturbed area would remain in an unvegetated state during the production period for the project—45-55 years. The remaining 60 percent of the disturbed area would have reduced productivity while reclamation is in progress and would have an altered species composition and density for the life of the project and beyond, including a long-term loss of shrubs. Estimated percentage vegetation disturbance by alternative, including the historical 5.6% disturbance, is:					
	10.0%	11.4%	9.9%	9.6%	9.0%	5.6%
Invasive, Non-Native Species	Initial surface disturbance would create opportunities for invasive species and development activity would increase the degree to which such species spread throughout the project area. The principal difference in impacts for the Proposed Action and each action alternative is related to the amount of surface disturbance that would initially occur for each:					
	Intermediate impact	Most impact	Intermediate impact	Intermediate impact	Lowest impact	No impact
Terrestrial Wildlife	Impacts would include loss of forage, as well as direct and indirect loss of habitat. The percentage of short-term disturbance of crucial winter range that would be disturbed includes historic plus new. Historic disturbance is 7.3% for pronghorn and 2.4% for mule deer. Significant impact can be reached by actions that result in disruption or irreplaceable loss of vital and high-value habitats such as crucial winter range and migration corridors, resulting in impacts that exceed the <i>High</i> or <i>Extreme</i> impact definitions. Big game species in the area are expected to be significantly affected by the Proposed Action and Alternatives A, B, and C but not by Alternative D .					

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Table ES-2. Comparison of impacts by alternative, *continued*

Feature/Resource	Proposed Action	Alternative A: 100-Percent Vertical Drilling	Alternative B: Enhanced Resource Protection	Alternative C: Cap (High and Low Density Areas)	Alternative D: Directional Drilling	Alternative E: No Action
Biological Environment, continued						
Pronghorn¹	<i>High Impact</i>	<i>Extreme Impact</i>	<i>High Impact</i>	<i>High Impact in High Density Area</i>	<i>Moderate Impact</i>	<i>No New Impact</i>
Mule Deer¹	<i>High Impact</i>	<i>Extreme Impact</i>	<i>High Impact</i>	<i>High Impact in High Density Area</i>	<i>Moderate Impact</i>	<i>No New Impact</i>
Aquatic Wildlife	For the Proposed Action and all action alternatives , impacts to aquatic wildlife are primarily associated with increased sediment entering aquatic habitats from ground-disturbing activities and road building adjacent to or crossing aquatic habitat but significant effects are not expected. Alternative B has additional protections for the Muddy Creek/Bitter Creek watersheds and other aquatic habitats such as the Chain Lakes wetlands and playas.					
	<i>Intermediate impact</i>	<i>Most impact</i>	<i>Intermediate impact</i>	<i>Intermediate impact</i>	<i>Least impact</i>	<i>No new impact</i>
Special Status Wildlife	Those Special Status wildlife species that have potential impacts from the Proposed Action or any of the action alternatives approaching or reaching the level of significance are identified below. Sage-grouse within core areas are not expected to be affected to a degree that approaches significance because of the SGEO's application on private and state lands as well as federal lands.					
Sage-grouse (non-core area only)	<i>Likely to exceed in non-core areas</i>	<i>Likely to exceed in non-core areas</i>	<i>Not expected to exceed</i>	<i>Less likely to exceed than Proposed Action</i>	<i>Not expected to exceed</i>	<i>No new impact</i>
Endangered Fish	Impacts to the four Endangered fish found downstream of the project area are not expected to occur under any alternative, except for minor water depletion. A determination on potential water depletions is contingent on consultation with the USFWS.					
Sensitive Fish	Sensitive fish are found primarily in the Muddy Creek drainage; the likelihood of impacts to these species exceeding the significance criteria under the Proposed Action and the action alternatives is:					
	<i>Will exceed</i>	<i>Will exceed</i>	<i>May exceed if actions on private lands offset public land restrictions</i>	<i>Likely to exceed</i>	<i>Less likely to exceed</i>	<i>No new impact</i>

¹ The impact levels noted for Pronghorn and Mule Deer are based on WGFD (2010) definitions.

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Table ES-2. Comparison of impacts by alternative, *continued*

Feature/Resource	Proposed Action	Alternative A: 100-Percent Vertical Drilling	Alternative B: Enhanced Resource Protection	Alternative C: Cap (High and Low Density Areas)	Alternative D: Directional Drilling	Alternative E: No Action
Biological Environment, continued						
Special Status Plants	Measures aimed at avoiding and protecting special-status plants that would be implemented under the Proposed Action and all action alternatives would insure that special-status plants would be little affected directly. To the extent that surface disturbance decreases and the number of disturbance sites is reduced, the likelihood of adverse impact is diminished further.					
Wild Horses	Long-term AUM (animal unit month) loss in Lost Creek and Adobe Town HMAs is estimated at:					
	<i>80 AUMs</i>	<i>106 AUMs</i>	<i>77 AUMs</i>	<i>73 AUMs</i>	<i>63 AUMs</i>	<i>0 AUMs</i>
Human Environment						
Visual Resources	Under the Proposed Action and all action alternatives , adequate visual mitigation in the form of BMPs and conditions of approval would allow oil and gas development to be compatible with the management objectives for VRM Class III landscapes in the project area by partially retaining the existing character of the landscape. Development would be compatible per se with VRM Class IV objectives because VRM Class IV is meant to allow for major modification of the existing character of the landscape. There would be no new impacts under Alternative E, No Action .					
Recreation	The intensity of impacts to recreation would correlate to the variation in long-term surface disturbance by alternative:					
	<i>Intermediate impact</i>	<i>Most impact</i>	<i>Intermediate impact</i>	<i>Intermediate impact</i>	<i>Least impact</i>	<i>No new impact</i>
Lands with Wilderness Character (LWC)	Under the Proposed Action and all alternatives , there would be no impact on LWCs.					
Cultural and Historical Resources	Pre-disturbance surveys and avoidance would minimize adverse impacts and remove the potential for significant impacts for all alternatives; the number of sites that might be identified (and the number potentially eligible for NRHP), are described by alternative:					
	<i>1,888 (434)</i>	<i>2,467 (568)</i>	<i>1,821 (418)</i>	<i>1,718 (395)</i>	<i>1,455 (362)</i>	<i>No new impact</i>

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Table ES-2. Comparison of impacts by alternative, *continued*

Feature/Resource	Proposed Action	Alternative A: 100-Percent Vertical Drilling	Alternative B: Enhanced Resource Protection	Alternative C: Cap (High and Low Density Areas)	Alternative D: Directional Drilling	Alternative E: No Action
Human Environment, continued						
Socioeconomics	The Proposed Action and the action alternatives would generate similar effects with minor differences. About 1,600 direct project-related jobs would be created by Year 15 of development. Total project-related employment (direct, indirect, and induced jobs) would climb to a peak of around 4,000 jobs in Year 14, an addition to existing project employment. Employment effects would continue during production after the field is fully developed, but be lower than those during development. Following completion of development and production, regional employment would decrease by over 4,300 jobs, including both new and existing jobs, a net job loss. Population changes would closely follow employment gains and losses, peaking at about 3,700 new residents and almost 1,000 temporary workers during Year 15 of development and falling to about 700 residents by Year 20. Community facilities should be adequate to accommodate the added population but may require expansion during the latter part of the 15-year development cycle. Demand for community facilities would substantially diminish after development is completed. Substantial government revenues would be generated by the natural-gas production—about \$3.8 billion in federal royalties, an estimated \$530 million in state mineral royalties, and \$3.1 billion in ad valorem and gross products taxes. Project-related employment, population, and revenue generation effects would not occur under Alternative E, No Action .					
Transportation	Development-related estimated peak annual average daily traffic (AADT) by alternative is as follows (estimated long-term production-related AADT is the same for all alternatives, 1,360):					
	> 3,900	>4,217	Reduced from PA 1-2%	Reduced from PA 3-4%	Reduced from PA 3-11%	0
Noise	The Proposed Action and Alternatives would generate similar types of noise from construction and operations, including traffic-related noise. The volume of noise would be directly related to the number of well pads for each alternative, as follows:					
	6,126	8,950	5,798	5,299	4,032	0
Management Environment						
Range Resources	Estimated long-term forage loss (AUM equivalent) and number of allotments at risk of exceeding significance criteria (10% decrease in AUMs), by alternative, are as follows:					
	1,985 AUMs (four allotments at risk)	2,540 AUMs (more allotments at risk than PA)	1,921 AUMs (fewer allotments at risk than PA)	1,832 AUMs (fewer allotments at risk than PA)	1,574 AUMs (fewer allotments at risk than PA)	No new impact

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Table ES-2. Comparison of impacts by alternative, *continued*

Feature/Resource	Proposed Action	Alternative A: 100-Percent Vertical Drilling	Alternative B: Enhanced Resource Protection	Alternative C: Cap (High and Low Density Areas)	Alternative D: Directional Drilling	Alternative E: No Action
Management Environment, continued						
Oil and Gas and Other Minerals	Under the Proposed Action and all action alternatives , the natural gas resources of the project area would be developed fully. Natural gas reserves produced over the life of the project are estimated at 12.02 trillion cubic feet. Under Alternative E , the Operators would still possess lease development rights but it is assumed that fluid mineral resources would not be developed under this proposal.					
Health and Safety	The Proposed Action and all action alternatives would result in similar impacts to the public and site workers, including increased risk of vehicle collisions on interstate highways and local road systems.					
Waste and Hazardous Materials	Currently authorized and approved actions are already exerting stress on the permitted and authorized disposal facilities proximal to the project area. Authorization of the Proposed Action or Alternatives A through C would result in further stress to the capacity of permitted waste management units used by the operating companies, including those used for management of solid waste, produced water, and drilling mud. Alternative D may serve to extend the life of some existing disposal facilities.					

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SUMMARY DESCRIPTIONS: IMPACTS OF THE PROPOSED ACTION AND ALTERNATIVES

Geology. The project area straddles the Continental Divide and lies within the southern and eastern parts of the Great Divide and Washakie sub-basins of the Greater Green River Basin. The project area has surface sedimentary exposures of Quaternary, Tertiary, and Late Cretaceous age including the Green River, Battle Spring, Wasatch, Fort Union, and Lance Formations. These deposits are underlain by sedimentary rocks of the Late Cretaceous age, including Fox Hills Sandstone, Lewis Shale, Mesaverde Group, Steele Shale, Niobrara, Frontier, and Mowry Shale. Petroleum products are generally targeted within the Almond, Ericson, Rock Springs, and Blair formations of the Mesaverde Group.

Under the Proposed Action and action alternatives, there is a remote possibility that alteration of existing topography for well pad and access road construction could result in initiation of mass movement and landslides. Removal of surface vegetation and soil could accelerate erosion of surface features and result in gullying and siltation. The extent of impacts would be directly proportional to the amount of surface disturbance and would therefore vary by alternative, but would be low in all cases and would not be significant. Alternative A has the potential for the most impact, followed by the Proposed Action, and Alternatives, B, C, D, and E (No Action).

Paleontology. The CD-C project area is underlain by geological units that have a moderate to very high potential to produce scientifically important fossils: the Battle Spring and Fort Union formations (moderate) and the Green River and Wasatch formations (very high). Paleontological resources have been identified in over 30 localities within the project area. Excavation of pipeline trenches and construction of well pads, access roads, and ancillary facilities associated with the Proposed Action or its alternatives could result in the exposure and destruction of these resources, either directly as a consequence of construction or indirectly as a result of increased erosion rates. If these newly discovered resources are properly recovered and catalogued, the Proposed Action and its alternatives could result in a better understanding and knowledge of this resource. Increased access would be available to professional, permitted paleontologists and geologists but could lead to increased illegal collection. Impacts to paleontological resources would be more likely with alternatives that have the greatest amount of concentrated surface disturbance, both spatially and temporally. Alternative A has the potential for the most impact, followed by the Proposed Action, and Alternatives, B, C, D, and E (No Action). The impact significance criterion would not be exceeded.

Soils. Soils in the project area were formed from erosion of bedrock exposed at the surface and from lacustrine, alluvium, loess, and eolian deposits. The parent material is dominated by tertiary shales and sandstones and uplifted cretaceous sedimentary rock. Soils on the tertiary bedrock are poorly developed with little clay accumulation. Sandy soils occur on stabilized sand dunes and in areas with active dunes. Saline soils exist in playas, and sodic soils occur on alluvial fans derived from high-sodium parent materials.

The analysis in the EIS focuses on five potential soil limitations: water erosion, wind erosion, road construction, runoff potential, and reclamation potential. For the first three of these limitations, soils in the project area were generally rated as having slight or low to moderate limitation. Nearly 70 percent of the project area soils are rated as having *Slight* potential for water erosion, 80 percent as having *Moderate* potential for wind erosion, and 63.5 percent as having a *Moderate* limitation for road construction. About half the area soils have a *Moderate* to *High* runoff potential. The most severe potential soil limitation is the reclamation potential. Fifty percent of the project area has *Poor* reclamation potential and only 21 percent is rated as *Good*. The principal reasons for the *Poor* reclamation potential are High Soil Salinity (42 percent) and Soils Too Clayey (27 percent). To date, 57 percent of the wells that have been drilled within the CD-C project area are located within soils with poor reclamation potential.

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Impacts of the Proposed Action and the action alternatives on soils would be directly related to the amount of surface disturbance created. In decreasing order of magnitude, impacts would be greatest for Alternative A with an estimated 61,696-acre disturbance, and then sequentially less for the Proposed Action (47,200 acres), Alternative B (45,516 acres), Alternative C (42,955 acres), and Alternative D (36,449 acres). Alternative E would have no new disturbance. Full and successful implementation of required mitigation measures and BMPs would insure that the significance criteria would not be exceeded.

Water Resources. Approximately 70 percent of the project area is within the Great Divide Basin, a closed basin that is bounded by the Continental Divide on all sides and has no surface hydrologic outlet; 29 percent is within the White-Yampa Basin that includes the Muddy Creek Sub-basin; and 1 percent is within the Upper Green Basin. Muddy Creek is a high-elevation, cold-desert stream and a major drainage system within the project area. Streamflow varies with location along the drainage. Muddy Creek exhibits perennial flow for the majority of its length, and in some years flows intermittently because of irrigation water removal south of the George Dew/Red Wash wetlands complex. In years with high runoff amounts, Muddy Creek flows perennially throughout its length. Flow in the tributaries to Muddy Creek is predominantly ephemeral, responding to localized snowmelt and rainfall events, but tributaries may also experience some intermittent flow due to contributions from springs and seeps. Tributary channels are generally dry and prone to flashy, periodic flood events from isolated thunderstorm systems from May to October.

The Upper Muddy Creek Watershed/Grizzly Wildlife Habitat Management Area (WHMA) is located primarily east of the CD-C project area but the western-most portion lies within the CD-C project area. The goal of the WHMA is to “manage habitat for the Colorado River fish species unique to the Muddy Creek watershed” In the Grizzly WHMA, the WGFD has been working with the BLM, the grazing permittee, and the Little Snake River Conservation District (LSRCD) to implement similar measures. According to the Rawlins RMP, the area is open to oil and gas leasing with intensive management of surface-disturbing and disruptive activities.

Few streams in the Great Divide Basin exhibit perennial flow. Numerous ephemeral streams flow toward the center of the Basin and terminate in natural or artificially constructed impoundments or disappear because of losses to diversions, evaporation, and/or infiltration. Since a majority of the project area is within this closed basin, a majority of the surface water flow originating in the CD-C project area terminates within the project boundary. The Chain Lakes wetlands are located in the Basin, in the north central portion of the CD-C project area. The Chain Lakes WHMA consists of 30,560 acres of public lands surface in a checkerboard pattern.

Groundwater resources in the project area include unconfined aquifers, generally shallow, blanket-type deposits of Quaternary or Tertiary age found within 400–600 feet of the ground surface, and confined aquifers, bound by relatively impermeable rocks and in the deeper formations. The project area is located over the Great Divide (northern half of the project area) and Washakie (southern half) structural basins, with the Wamsutter Arch separating the two.

Quaternary age aquifers within the CD-C project area likely do not qualify as Underground Sources of Drinking Water (USDW) since there are no wells designated for such use. The yields from these aquifers are not likely sufficient to sustain a public water system. Tertiary age aquifers within the CD-C project area qualify as USDW based on the presence of Wamsutter municipal wells and on the suitability of the groundwater quality. Upper Cretaceous, Lower Cretaceous, Jurassic, and Pennsylvanian age and older aquifers may qualify as USDW based on water quality and on the quantity. However, due to the depth of the aquifers in the CD-C area (2,000 to 18,000 feet) and the low population density of the area, these aquifers are not likely to be the target for domestic or public water system wells.

Impacts to water resources resulting from project construction and operation could include: increased water runoff and downstream sediment loading as a result of surface disturbance; contamination from

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accidental releases of fluids associated with exploration and production operations, produced water, and other hazardous liquids to soils and surface-water systems; removal of groundwater; improper drilling and completion operations; and subsurface disposal of produced water.

Impacts to surface water resulting from the Proposed Action and the action alternatives would be considered significant under at least one and as many as seven of the eight significance criteria, depending on the amount of overall surface disturbance and the locations of drill pads and associated roads and pipelines. Impacts for Alternative A would be the most severe and would be reduced for the Proposed Action and Alternative B, C, and D. Alternative D, with the least surface disturbance of the action alternatives and the fewest disturbance locations, would have the least significant impact.

Impacts to groundwater are not expected to be significant because the aquifers targeted for gas development and produced-water disposal are located in formations below and isolated from the aquifers that produce springs and flowing wells utilized for stock and domestic purposes. In addition, existing federal and state laws and regulations provide protections that limit the potential for significant impacts on groundwater.

Air Quality. The CD-C air quality analysis addressed the impacts on ambient air quality and Air Quality Related Values (AQRVs) from potential air emissions due to the Proposed Action and alternatives and from other regional emissions sources within a defined study area. Potential ambient air quality impacts were quantified and compared to applicable state and federal ambient air quality standards and Prevention of Significant Deterioration (PSD) increments, hazardous air pollutant (HAP) thresholds, and AQRV impacts (impacts on visibility, atmospheric deposition, and potential increases in acidification to acid-sensitive lakes).

A near-field ambient air quality impact assessment was performed to evaluate maximum pollutant impacts within and near the CD-C project area using EPA's Guideline (EPA 2005) model, AERMOD, to estimate maximum potential impacts of carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), particulate matter greater than 10 microns or 2.5 microns in diameter (PM₁₀, and PM_{2.5}) from project emissions sources. Near-field HAP (benzene, toluene, ethyl benzene, xylene, n-hexane and formaldehyde) concentrations were calculated for assessing impacts both in the immediate vicinity of project area emission sources for short-term (acute) exposure assessment and for calculation of long-term risk.

A far-field ambient air quality impact assessment was carried out using CAMx (Comprehensive Air Quality Model with Extensions) to quantify potential air quality impacts to both ambient air concentrations of CO, NO₂, SO₂, PM₁₀, PM_{2.5}, and ozone, and AQRVs from air pollutant emissions of CO, nitrogen oxides (NO_x), SO₂, PM₁₀, PM_{2.5}, and volatile organic compounds (VOCs) expected to result from the development of the CD-C project as well as the combined effects of the CD-C project and other new sources of emissions in the region.

The modeling relied on an emission inventory developed for the project for each year over the expected life of the project. Emission inventories for all regional emissions sources from human activities and natural sources (e.g. wildfires) were compiled for use in the far-field modeling.

Near-field modeling indicated that production and field development source emissions of the Proposed Action and alternatives would not cause an exceedance of any ambient air quality standard and would not exceed the PSD Class II Increments at a 250-meter distance from project sources. However, modeled impacts at a 100-meter distance from field development project sources did result in short-term concentrations that were predicted to be above the 1-hour NO₂ NAAQS, the 24-hour PM_{2.5} NAAQS, and the 24-hour PM₁₀ WAAQS. Far-field and mid-field modeling using CAMx showed that the Proposed Action and alternatives would not cause any exceedances of the ambient air quality standards for ozone or any other criteria pollutant and would not exceed the PSD Class I or Class II increments at any of the Class I and sensitive Class II areas. The visibility analysis indicated a maximum of 5 days with project

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emissions resulting in impacts greater the 0.5 delta deciview (Δdv) threshold at any of the Class I and sensitive Class II areas; using the 98th percentile value as a threshold, there would be zero days above the 0.5 Δdv threshold.

Vegetation. The CD-C project area is located within the Omernik Level III “Wyoming Basin” Ecoregion 18, described generally as a broad intermontane basin dominated by arid grasslands and shrublands and interrupted by high hills and low mountains. Three vegetative cover types make up 78 percent of the project area: Wyoming Big Sagebrush (the most common at 39 percent), greasewood flats and fans (23 percent), and saltbush flats and fans (16 percent).

Within the project area, the ecoregion is further divided into two Level IV ecoregions: Rolling Sagebrush Steppe and Salt Desert Shrub Basins. The Rolling Sagebrush Steppe is a semiarid region of rolling plains, alluvial and outwash fans, hills, cuerdas, mesas, and terraces, with average annual precipitation from 10–12 inches. The dominant vegetation in this ecoregion is sagebrush, often associated with various wheatgrasses or fescue. The ecoregion is interspersed with desert shrublands, dunes, and barren area in more arid regions (e.g., Red Desert); and with mixed-grass prairie at the eastern limit. The Salt Desert Shrub ecoregion includes disjunct playas and isolated sand dunes. The plains, terraces, and rolling alluvial fans of this ecoregion have soils that tend to be more alkaline and less permeable than soils in the Rolling Sagebrush Steppe. Vegetation is a sparse cover of xeric-adapted species such as shadscale, greasewood, and Gardner’s saltbush. This arid region is sensitive to grazing pressure, which may promote the spread of invasive weeds.

Direct impacts to native shrub/grassland communities within the CD-C project area would be similar under the Proposed Action and all action alternatives—an initial reduction of herbaceous vegetation and a long-term loss of shrubs due to soil disturbance and related construction activities. These impacts could be mitigated by successful implementation of reclamation practices, but about 40 percent of the disturbance would remain in an unvegetated state for the life of the project—30–40 years at each individual well site—while used for access roads and well pad facilities. The remaining 60 percent would have reduced productivity while reclamation is in progress and would have an altered species composition and density for the life of the project and beyond, including a long-term loss of shrubs.

Vegetation could be impacted indirectly as a result of soil compaction, mixing of soil horizons, loss of topsoil productivity, and increased soil-surface exposure resulting in soil loss due to wind and water erosion. Other indirect impacts could occur as a result of altered runoff hydrology due to roads, well pads, and other facilities, particularly on moderate to steep slopes. Additional indirect impacts would occur due to deposition of dust on vegetation near roads and construction sites, reducing plant productivity and vitality. The increased surface disturbance produced by project implementation would also provide opportunities for invasive plant species to establish and spread.

As with soils, the principal difference in impacts among alternatives is related to the amount of surface disturbance that would initially occur for each. In decreasing order of magnitude, impacts would be greatest for Alternative A with an estimated 61,696-acre disturbance, and sequentially less for the Proposed Action (47,200 acres), Alternative B (45,516 acres), Alternative C (42,955 acres), and Alternative D (36,449 acres). Alternative E, with no new development, would have no new disturbance.

Non-native, Invasive Plant Species. The principal invasive weeds known to occur on or near, or which have been treated within, the CD-C project area include: Russian knapweed (*Centaurea repens*), houndstongue (*Cynoglossum officinale*), halogeton (*Halogeton glomeratus*), hoary cress (whitetop) (*Cardaria draba* and *Cardaria pubescens*), perennial pepperweed (giant whitetop, *Lepidium latifolium*), spotted knapweed (*Centaurea maculosa*), common burdock (*Arctium minus*), and saltcedar (*Tamarix* spp.). The primary impact of these invasive species to the range resource is their ability to out-compete native species, reducing the quality of available forage for wildlife and livestock and also diminishing the long-term productivity, diversity, and aesthetic values of lands within the project area. In addition to their competitive nature, leafy spurge, Russian knapweed, halogeton, and houndstongue are poisonous.

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Halogeton was selected as a worst-case example of non-native invasive species known to exist in the CD-C project area and a survey was conducted in 2007. At that time an estimated 13,353 acres (about 1.2 percent of the project area) were infested with halogeton. Halogeton has continued to spread since the survey was made and the infestation as of 2012 is likely greater.

Impacts to vegetation and range resources would occur on public lands under the Proposed Action and all action alternatives, due to an increase in surface disturbance that could provide more suitable habitat for invasive weed infestations. The risk of infestation and spread of invasive, non-native plant species within the CD-C project area would be similar under all alternatives because initial surface disturbance would create opportunities for new infestations and new development activity would increase the degree to which such species spread throughout the project area. The extent of impact from invasive, non-native species is directly related to the amount of surface disturbance that would initially occur for each alternative. Alternative A has the potential for the most impact, followed by the Proposed Action and Alternatives B, C, D, and E (No Action). In addition to the CD-C project, several other natural gas projects located adjacent to the project area could provide cumulative invasive species impacts. Additionally, three transmission-line projects are proposed to cross the project area and vehicles/equipment associated with the planning and construction of those projects provide other potential seed sources and seed vectors.

Wildlife. At least 396 wildlife species occur in and around the project area including: 77 mammal, 273 bird, six amphibian, 10 reptile, and 30 fish species. Most are common and have wide distribution in the region. Species considered in the EIS include big game species, upland game birds, raptors, neotropical birds, and fish. The big game species in the project area are pronghorn, mule deer, and elk. Crucial winter and crucial winter/yearlong ranges of pronghorn and mule deer collectively comprise approximately 92,842 acres (8.7 percent) of the project area. Greater sage-grouse, Columbian sharp-tailed grouse, and mourning doves occur within the project area. Twenty-six raptor species are known to occur in or around the project area, including 14 that breed or potentially breed in the project area, two that over-winter, and ten that have been recorded as transients or migrants. Many species of neotropical songbirds utilize the project area for breeding, feeding, migration, and as year-round habitats. About 30 species of fish may occur in the project area or in streams upstream or downstream of the project area, including ten game-fish species and 20 non-game fish species.

Because of the long timeframe for recovery of shrub habitats after vegetation removal, terrestrial wildlife dependent on shrub habitats would be impacted most by habitat loss. In addition to the physical removal of habitat, disturbance during construction and production can displace or preclude wildlife use during all seasons. Timing restrictions for critical times of year have been developed for the most sensitive species and would generally be implemented during the development phase, but no restrictions would apply during the production phase. Other impacts from natural gas development include habitat fragmentation, reduced availability and palatability of forage due to dust, and mortality from collisions involving vehicles and wildlife.

Pronghorn and mule deer are the wildlife species most impacted by development, particularly in their winter range where previous development has already reduced the quality of the habitat. Impacts from the Proposed Action and Alternatives A and C are likely to reach the level of significance for pronghorn and mule deer CWR and associated migration routes.

Because the BLM places buffers around active raptor nest sites and restricts other activities around raptor nests and because most raptor prey use habitat that can be reclaimed in a timely fashion, the impact from the Proposed Action or the action alternatives is not expected to exceed the significance criteria.

The project could result in some unintentional, direct mortality of small birds and small mammals from vehicle collisions; however, this mortality is expected to be negligible and is not likely to reduce populations within the project area. If standard prescribed environmental protection measures and BMPs

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are implemented under the Proposed Action or the action alternatives, the impacts on songbird and small-mammal populations are not expected to exceed the impact significance criteria.

All of the fish species that are not BLM Sensitive Species have wide distribution within Wyoming. Consequently, the project and other human activities within the Muddy Creek and Great Basin watersheds may have localized population impacts but should not impact their status range-wide.

The cumulative impact of multiple individual projects may result in a large area potentially exposed to increased fragmentation, disturbance of wildlife and their habitats, disruption of migratory corridors, and the loss of refuge areas. Additional effects are expected on wildlife dispersal, the reduction of non-fragmented habitats, competition with livestock, and competition with other wildlife species. The generalized increase of human presence and associated disturbance across such a broad scale are a concern.

Special Status Species. The greater sage-grouse, a candidate for federal listing as Threatened or Endangered, is present within the CD-C project area. Four species of Endangered fish are present downstream of the project area, including the Bonytail (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), and razorback sucker (*Xyrauchen texanus*). Potential habitats for the Endangered blowout penstemon (*penstemon haydenii*) and the Threatened Ute ladies'-tresses (*spiranthes diluvialis*) are present, and therefore the species are potentially present. The Endangered black-footed ferret is unlikely to occur within the project area; however, white-tailed prairie dog colonies in the Continental Divide, Dad, and Desolation Flats areas provide potential habitat and prey for this species and those areas have not been surveyed to confirm whether black-footed ferrets are present.

The following species listed by the BLM as Sensitive are present or potentially present within the CD-C project area: pygmy rabbit, swift fox, white-tailed prairie dog, Wyoming pocket gopher, bald eagle, Brewer's sparrow, loggerhead shrike, sage sparrow, sage thrasher, burrowing owl, ferruginous hawk, long-billed curlew, mountain plover, trumpeter swan, white-faced ibis, Great Basin spadefoot, northern leopard frog, roundtail chub, bluehead sucker, and flannelmouth sucker.

The Proposed Action and action alternatives would disturb and alter wildlife habitat during the 15-year development period, in addition to the 60,176 acres previously disturbed by natural gas and other development. Reclamation of disturbed habitats should recover grass-dominated habitats in one to several years, depending on precipitation. Shrub habitats would not reach pre-disturbance levels during the life of the project. The greater sage-grouse, loggerhead shrike, sage sparrow, and sage thrasher, which are dependent on shrub habitats, would be impacted most by habitat loss.

In addition to the physical removal of habitat, disturbance during construction and production can displace or preclude wildlife use during all seasons. Timing restrictions for the critical times of year have been developed for the most sensitive species and would generally be implemented during the development phase, but no restrictions would be in place during the production phase. Other impacts from natural gas development include habitat fragmentation, reduced availability and palatability of forage due to dust, and mortality from collision between vehicles and wildlife. The measures aimed at avoiding and protecting special status plants that would be implemented under the Proposed Action and all alternatives would insure that potential impacts to special status plants would be minimized or eliminated.

Because of the protections provided by the BMPs, COAs, and occupancy/timing restrictions required for many special status species, the impact level of significance would likely only be reached under one or more of the action alternatives, but not all, for sage-grouse in non-core areas, and sensitive fish. Sage-grouse in core areas would not be significantly affected under any alternative because impacts would be substantially ameliorated by the application of the Core Population Area density and disturbance limitations and mitigations (IM WY-2012-019 and Statewide Executive Directive 2011-05 for protection of Greater Sage-grouse Core Areas [SWED 2011]) on private and state lands as well as federal. Given the

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application of this guidance, development activity would not lead to a significant impact on the sage-grouse core area populations.

It is expected that for the Proposed Action and Alternatives A and C, significance criteria could be exceeded for sage-grouse outside the core area. Ferruginous hawk nests located near private or state surface in the checkerboard would not benefit from the entire 1-mile seasonal buffer zone but it is not expected that significance criteria would be exceeded as other factors such as topography could decrease the size of the needed buffer around nests. Other special status species should be protected sufficiently by the COAs, RMP requirements, and BMPs to avoid exceeding the significance level.

Alteration of sensitive fish habitat suitability from sedimentation would result in significant impacts to sensitive fishes under the Proposed Action and Alternatives A and C, but not under Alternative B and possibly not under Alternative D.

The cumulative effect of the CD-C project and other reasonably foreseeable future projects on greater sage-grouse would be substantially ameliorated by the application of the Core Population Area density and disturbance limitations and mitigations on private and state lands as well as federal.

Wild Horses. The BLM protects, manages, and controls wild horses within Herd Management Areas (HMAs). Portions of two HMAs are located within the CD-C project area: 119,600 acres of the 251,000-acre Lost Creek HMA in the northwest corner, and 5,826 acres of the 472,812-acre Adobe Town HMA along the southwest perimeter west of Baggs. Both HMAs are located within livestock grazing allotments, and each allotment has an allocated number of Animal Unit Months (AUMs). The primary direct impact to wild horses would be loss of available forage as a result of surface disturbance. Indirect impacts could result from increased potential for horse/vehicle collisions and increased dust as a result of increased traffic. Alternative A has the potential for the most impact to wild horses, followed by the Proposed Action, and Alternatives, B, C, D, and E (No Action). For both the Proposed Action and Alternative A, long-term loss of forage is estimated at less than 0.2 percent of the total forage in the allotment for the Lost Creek HMA and less than 0.1 percent for the Adobe Town HMA. Because the relative loss of forage would be so small, however, none of the grazing allotments in either HMA would undergo a reduction in the amount of AUMs allocated.

Visual Resources. The CD-C project area is part of a semiarid desert dominated by patches and thickets of sagebrush. Colors of gray, brown, and olive characterize the vegetation, with grasses and forbs changing to shades of brown as they cure in the summer and fall. Soils and rock strata are shades of red, gray, and brown. The landscape is generally unbroken, so visual contrast draws attention wherever it occurs. Dune fields, playas, cuevas, occasional escarpments, and eroded streambeds create some visual contrast.

Visually prominent features in the project area are the Red Desert Basin, the Chain Lakes Basin, the extended Delaney Rim-Wamsutter Rim cuesta-and-valley complex, and North Flat Top, the high point in the project area. North Flat Top, Little Robbers Gulch, and The Bluffs are prominent geologic features visible from Wyoming Highway (WY) 789, the major north-south road through the southern part of the project area. Interstate 80 (I-80) bisects the project area from east to west. Because of high traffic volumes, I-80 is the vantage point from which potentially the most viewers see the project area. Because of the extensive road network, all land within the project area is in the foreground or middle ground of major or other roads.

The potentially affected scenic quality in the project area is currently low to moderate overall. Cultural modification due to oil and gas development has negatively affected scenic quality in seven of 15 identified landscape-rating units that are contained wholly or in part within the project area. This is generally because oil and gas development disturbs existing vegetation and introduces structures whose unnatural forms, lines, colors, and textures contrast with the natural landscape character.

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Sixty percent of the project area is classified by the BLM as Visual Resource Management (VRM) Class III. The objective of Class III is to partially retain the existing character of the landscape. The level of change to the landscape should be moderate; management activities may attract the attention of the casual observer but should not dominate the view of the casual observer. The remainder of the project area is classified as VRM Class IV, where the objective is to provide for management activities that require major modifications to the existing character of the landscape and the level of change to the landscape can be high.

Visual mitigation in the form of BMPs and COAs would allow oil and gas development to be compatible with the management objectives for VRM Class III landscapes in the project area. Development would be compatible *per se* with VRM Class IV objectives because VRM Class IV is meant to allow for major modification of the existing character of the landscape. Less degradation of landscape quality would potentially occur under Alternatives B, C, and D and more would occur under Alternative A, when compared to the Proposed Action. The combination of CD-C project impacts and the Gateway South and TransWest transmission line right-of-way systems could create a high cumulative impact in some viewsheds in the VRM Class III parts of the CD-C project area. Visual impacts from CD-C and other planned or reasonably foreseeable development may add up to a high enough level of incompatible contrast with existing settings to be non-compliant with VRM Class III.

Recreation. Big game hunting and associated off-highway vehicle use constitute the primary recreational uses of public lands within the project area. Pleasure driving to view wildlife, especially wild horses, is a secondary use that occurs mainly within the Red Desert area. There is one undeveloped recreation site at Little Robbers Gulch Reservoir near the southern boundary of the project area that has been in historical use as a group hunting camp and fishing hole.

Impacts to recreation resulting from the Proposed Action and action alternatives would directly correlate to impacts to wildlife, wild horses, the visual setting, traffic, and noise. In turn, these impacts would be directly related to the amount of surface disturbance and the increase in surface disturbance in relation to existing disturbance. Overall, Alternative A has the potential for the greatest amount of impact to recreation, followed by the Proposed Action, and Alternatives, B, C, D, and E (No Action). The intensity of impacts to recreation would potentially be highest in the northern part of the project area, where natural gas development is less dense to date and where the Chain Lakes Wildlife Habitat Management Area and the large block of public land to the northwest are a resource for big game hunting and other wildlife-based recreation.

Lands with Wilderness Characteristics (LWCs). The RFO maintains an inventory of LWCs on a continuing basis and relies on this inventory in the development and revision of land use plans and when making subsequent project level-decisions. No LWCs are located within the boundaries of the CD-C project area.

Cultural and Historical Resources. Portions of the Overland and Cherokee Trails, the 1868 Union Pacific Railroad Grade, and the Lincoln Highway (US 30 and I-80 corridor) are located within the CD-C project area and eligible for listing on the National Register of Historic Places (NRHP). The BLM has designated a quarter-mile buffer around these linear resources and associated sites as highly sensitive. Natural gas development within this buffer would not be permitted. A 2-mile analysis area surrounding these trails and associated sites is considered as the setting. Where the setting of historic trails and associated sites contributes to eligibility for listing on the NRHP, actions resulting in the introduction of visual elements that diminish the integrity of the property's significant historic features would be mitigated. BMPs would be implemented to reduce visual impacts to the setting, such as consolidation of facilities, use of low-profile tanks, and paint colors that blend with surrounding terrain. Increased access to and activity within the project area during construction associated with the Proposed Action and alternatives could result in increased indirect impacts to archaeological sites such as changes in erosion

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patterns, soil compaction, or vegetation removal; fugitive dust; off-road vehicle traffic associated with construction or maintenance activities; and increased vandalism, including illegal artifact collection.

The amount of potential impact to historic and archaeological resources is related to the amount of surface disturbance. Impacts under Alternative A would be the greatest, with a potential 2,467 sites that could be affected. Impacts would decrease proportionately for the Proposed Action (1,888 potentially affected sites), followed by Alternatives B (1,821 potentially affected sites), C (1,718 potentially affected sites), and D (1,458 potentially affected sites). No impacts would occur under Alternative E, No Action, because there would be no new surface disturbance. Avoidance and mitigation would remove the potential for significant impacts on public lands for all alternatives.

Socioeconomics. Implementation of the Proposed Action or other action alternatives would allow substantially more and higher-paced development and production activity in the CD-C project area. The additional development activity is assumed to extend over 15 years, and production would continue for 30–40 years thereafter. This activity would be accompanied by increased employment associated with development and production activities for companies that service gas field development and production activities, and in other sectors of the local economy. The additional employment would result in concurrent increases in temporary and long-term population for communities in Carbon and Sweetwater counties. In turn, the additional population would require temporary and long-term housing, place demands on local public facilities and services, and generate increases in revenues for local business establishments.

The added development and production would generate substantial tax revenues for local and state governments, which could fund higher public-sector operating costs and facility and service expansion in response to development-related demands. But the timing of the receipt of those revenues and their distribution would not in all cases coincide with the timing and location of demand.

Continued natural gas development within the CD-C project area would also increase the potential for conflicts between natural resource development and outdoor recreation and grazing activities. Given the existing level of development, the incremental effects of potential conflicts and displacement are likely to be minor to moderate across most of the project area. However, conflicts with important environmental values could arise in several areas.

All action alternatives have the potential to both positively and adversely affect local and regional economic diversity. Positive effects would include sustained support for existing businesses and possible expansion of the commercial and service sectors in response to natural gas-related increased demand; such expansion could also serve increases in tourism, outdoor recreation, and interstate travel. Similarly, the development of community and commercial infrastructure to support development-related demand would enhance the capacity to accommodate other economic activities in the long run. Adverse effects that could limit economic diversification would include increased competition for labor, increased housing costs, and potential effects on regional environmental amenities, particularly during the 15-year development period.

The level of development contemplated by the Proposed Action and other action alternatives is contingent upon natural gas prices being sufficiently high to support that level of development from an economic perspective. The natural-gas reserves in the project area are part of a larger regional resource base. Consequently, periods of faster or slower-paced development would generally occur in the context of regional energy development expansion and decline in southwest Wyoming and indeed across much of the Rocky Mountain west. In other words, extended periods of elevated demand for natural gas and resultant high gas sales prices would generally correlate with periods of accelerated development activity in the project area and in other natural-gas fields in Carbon, Sweetwater, and adjacent counties. Conversely, extended periods of lower natural-gas demand or relatively higher availability of gas from other sources would result in regional slowdowns in development activity. The effects of such regional

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potentials are discussed in the 2008 Baseline Socioeconomic Technical Report and in Chapter 5 of this EIS.

The BLM and Operators consider the natural gas production volumes forecast for this assessment technically recoverable given current technology and knowledge. The ultimate level of recovery would depend on natural gas prices, future improvements in technology for developing and producing gas resources, markets for the gas, and delivery capacity to collect, process, and deliver the gas to market. This assessment assumes that the forecast natural gas production volumes would be recovered, while acknowledging the potential for lower gas prices and corresponding lower levels of development and production. This assumption provides a basis for assessing reasonable potential upper bounds of effects on socioeconomic conditions including the fact that natural gas sales prices to support this level of development would also provide tax revenues to aid the state and communities in responding to development-related effects, as well as continued support for existing programs and services locally and throughout the state.

Transportation and Access. The Proposed Action and all action alternatives would result in natural gas development and production-related increases in traffic on federal and state highways and county and BLM roads that provide access to and within the CD-C project area. The pattern of traffic increases would be similar for all alternatives but the level of increase would vary moderately by alternative. Each action alternative would result in temporary increases in annual average daily traffic on federal and state highways resulting from construction of ancillary facilities such as field compression facilities, a central pipeline compression facility, a central gas-processing/stabilization facility, and a high-pressure gas line. For I-80, the level of increase would be relatively modest compared to existing levels of traffic. A number of other reasonably foreseeable projects could generate cumulative effects on I-80; wind farm construction; other, smaller oil and gas development projects; power transmission lines; and an in-situ uranium project. The effect would be greatest during construction of the projects and the overall effect would depend greatly on the relative timing of the construction of the projects.

The Proposed Action and all action alternatives would accelerate highway maintenance requirements on county, BLM, and private roads. The timing and level of improvements and maintenance requirements would be driven by the magnitude and characteristics of traffic increases on specific highways and roads. Some temporary increases in congestion could occur on local streets in some communities in Carbon and Sweetwater counties and there would be a statistical potential for increases in motor vehicle accidents, primarily during the 15-year development period. All action alternatives would generate similar amounts of revenue that could be used to fund highway and road-maintenance needs.

Noise. Existing sources of noise in the CD-C project area include gas compression stations, livestock grazing operations, wind, well workover operations, and traffic along area access roads, state highways, and I-80. Additional noise would be generated under the Proposed Action and action alternatives by well site and access road construction, drilling and completion, pipeline construction, and surface-disturbing reclamation operations. Noise levels may at times temporarily exceed EPA thresholds in specific locations. The duration of noise-generating activity and dispersal of noise-generating equipment across the project area would be greatest under the Proposed Action.

Directional wells are considered in the Proposed Action and Alternatives B, C, and D. Directional drilling may require a larger rig with larger engines operating at higher decibel and lower frequency levels compared to rigs for vertical drilling. Alternative A, 100-Percent Vertical Drilling, would result in the greatest number of generation sources. The number of days needed for drilling and completion may be slightly fewer compared to directional wells; however, the time savings could be negated by the amount of time required for a rig move. Design features of Alternative B (Enhanced Resource Protection) would serve to reduce noise in sensitive environments, but these reductions could be negated by the noise of semi/haul trucks moving drilling rigs. Alternative C could result in areas with concentrated development activity, where noise levels would be greater than those found in areas of more dispersed operations. The

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surface disturbance cap could slow the pace of development, especially in the high-density development areas, and extend development noise levels over a longer time than the Proposed Action. Alternative D (Directional Drilling) would result in an overall reduction in well pads and roads built and provide only localized areas of noise.

Range Resources. Impacts to livestock and grazing resources would occur under the Proposed Action and all action alternatives. Impacts could include those caused by a reduction of total available forage due to road, well pad, and pipeline construction and maintenance; improperly fenced open pits; vehicle traffic; fugitive dust deposited on potential forage; accidental spills of potentially hazardous materials; and creation of suitable habitat for invasive/noxious weed infestations. Livestock may be injured or killed by vehicle collision, become trapped in open pipeline trenches, stray from pastures through gates left open, and ingest poisonous invasive species. Additionally, existing range improvements can be damaged by equipment and vehicles. The level of impact resulting from the Proposed Action and action alternatives would be related to the amount of surface disturbance that would initially occur for each alternative.

Loss of forage in a grazing allotment due to oil and gas development could result in a long-term reduction of the stocking rate for the allotment if the total long-term surface disturbance exceeds 10 percent of the allotment area. Of the 44 allotments within or overlapping the CD-C project area, two already have disturbance in excess of 9 percent, and nine more have disturbance in excess of 5 percent. The Proposed Action and alternatives have the potential to result in a long-term reduction in the stocking rate for these allotments until existing and new disturbance is successfully reclaimed. For the Proposed Action, it is estimated that an initial forage loss equivalent to 5,488 of the total 123,910 AUMs within the CD-C project area could occur. AUMs lost would be recovered with successful reclamation of initial disturbance. Estimated forage equivalent lost for Alternative A would be 7,174 AUMs; for Alternative B, 5,293 AUMs; for Alternative C, 4,995 AUMs; and for Alternative D, 4,238 AUMs. Under Alternative E, No Action, no forage loss would occur.

Oil and Gas and Other Minerals. Under the Proposed Action and all action alternatives, recoverable natural gas reserves produced over the life of the project are estimated at 12.02 trillion cubic feet (Tcf); liquid condensate is estimated at 167.3 million barrels. With this amount of production from the target formations, it is expected that the oil and natural gas resource in the CD-C project area would have been substantially depleted, pending new technology or the discovery of new reserves. Under Alternative E, No Action, no more natural gas or liquid condensate would be produced in the CD-C project area.

Health and Safety. Implementation of the Proposed Action and all action alternatives would likely result in an increased risk to the workforce due to the increased number of personnel in the field, the increase in heavy equipment use and drilling operations, and the resultant increase in vehicle traffic. Compliance with the State of Wyoming Department of Employment Workers Occupational Health and Safety (WOSHA) program rules and regulations for construction and oil and gas well drilling, well servicing, and well special servicing operations would aid in reducing project-related occupational hazards. Risks to the project workforce would decline substantially once construction, drilling, and completion are concluded and the project enters the production phase. The Proposed Action and all action alternatives would result in similar impacts to the public and site workers with regard to increased risk of vehicle collisions on interstate highways and local road systems during the development and production phases.

Waste and Hazardous Materials. With the exception of produced water, most waste materials that would be generated at project locations are considered to be solid and classified as non-hazardous, and are disposed of at approved facilities offsite. Some operators recycle drilling mud between wells for re-use, reducing the volume to be disposed of. Completion fluids are also recycled to the extent possible to minimize waste disposal but are generally produced to an open pit onsite for disposal. Produced water within the project area would continue to be managed through the use of private and commercially permitted evaporation ponds and injection/disposal wells. Hazardous wastes and disposal sites are permitted and managed in compliance with Wyoming Department of Environmental Quality regulations.

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Currently authorized and approved actions are already exerting stress on the permitted and authorized disposal facilities near to the project area. Authorization of the Proposed Action or Alternatives A, B, or C would result in further stress to the capacity of permitted waste management units, including those used for management of solid waste, produced water, and drilling mud. Alternative D may serve to extend the life of some existing disposal facilities if it results in higher levels of recycling and reuse of drilling materials.